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DRY ROT OF POTATO TUBERS

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The potato, Solanum tuberosum L., belongs to the nightshade family Solanaceae. It is native to the Andean region of South America (3, 6). It ranks as one of the leading food crops in the world and is the leading vegetable in the United States in terms of dollar value. While Florida is not ranked among the leading States in potato production, the value of the crop is about $20 million annually (1). The largest concentrated area of production is in the Hastings area, where in 1984, 25,000 acres of potatoes, over 80 percent of the Florida crop, were planted (1).

One of the diseases affecting potatoes is the dry rot syndrome. This disease affects planted seed tubers, mature tubers prior to harvest, and tubers in storage.

CAUSAL AGENTS AND DISTRIBUTION. Fusarium solani var. coeruleum (Sacc.) Booth, F. sambucinum Fuckel, F. sulphureum Schlecht., and F. trichothecioides Wollenw. are implicated in storage rot of potatoes (2, 4, 5). The first, generally known as powdery, dry, or white rot of stored potatoes, is most frequently encountered and is the most aggressive pathogen (4). It is present in all the potato-growing regions of the northern hemisphere, as well as in Australia and New Zealand (2). Heavy losses of stored potatoes have also been reported in Malawi (2). In Argentina, this variety of F. solani was found to be amongst the chief pathogens (2).

The storage rot of potatoes caused by F. sambucinum can be a serious problem; in both Europe and eastern Canada it is known as the common rot of stored potatoes (2). Fusarium sulphureum is economically important as a storage rot of potatoes where it may compete or be associated with F. sambucinum. This storage rot has been reported from eastern Canada, from both the east and west coasts of USA, and from Europe (2). Fusarium trichothecioides occurs widely, but its economic importance is principally as a storage rot, chiefly of potatoes. This disease is referred to as white powdery dry rot and occurs in Europe, N. America and Australia, where it may cause serious loss of seed potatoes (2). Fusarium avenaceum (Corda ex Fr.) Sacc., virtually world-wide in distribution, also causes a dry rot of potatoes, but less frequently than the other species (4). Fusarium oxysporum Schlecht. f. sp. tuberosi Snyder & Hansen was first reported in 1904 as causing dry rot of potatoes (7).

In June of 1984, tubers of S. tuberosum 'Kennebec' from Columbia County, Florida exhibiting dry brown patches on the surface of the tubers were received by the Division of Plant Industry, Florida Department of Agriculture and Consumer Services, for diagnostic evaluation. When longitudinal sections were made through the brown patches (lesions), mycelial growth of Rhizoctonia solani Kuhn was evident in cavities within the tubers. This is the first report of R. solani being associated with the dry rot syndrome of potato tubers. Fusarium oxysporum and F. solani were also isolated from the infected tissue and were part of this disease complex. No attempt was made to confirm the pathogenicity of any of the fungi isolated.

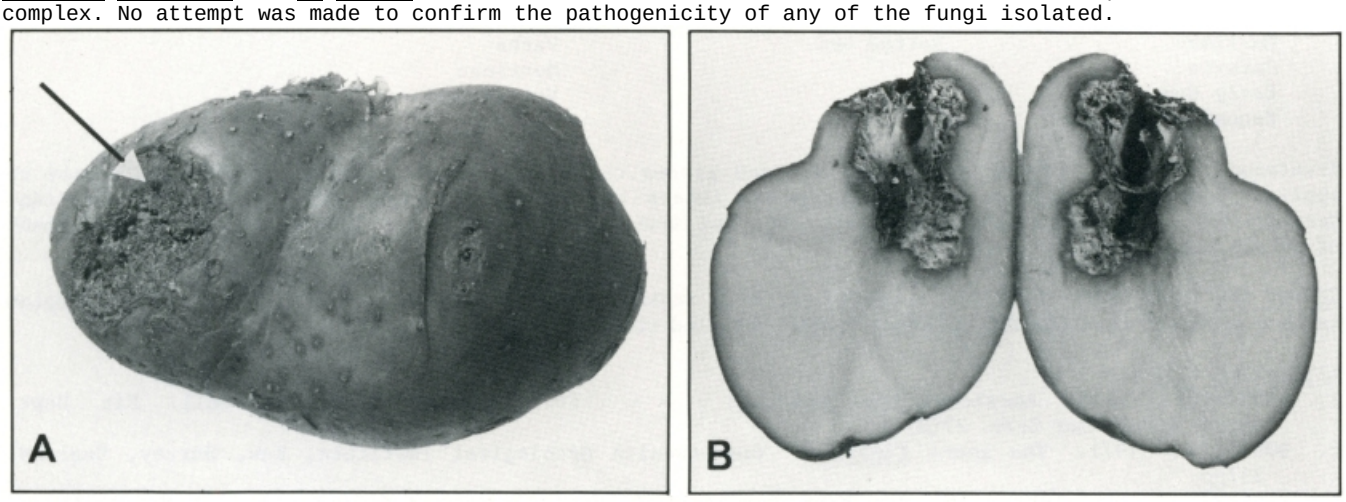

Fig. 1. A) Dry rot of Solanum tuberosum 'Kennebec'. Tuber lesion indicated by arrow. X 0.8. B) Longitudinal section through a dry rot lesion of a 'Kennebec' potato tuber showing internal cavity. X 0.6. (DPI Photos #703003-9 and 703003-10)

SYMPTOMS. Dry rot of potato tubers can be a difficult disease to detect because external symptoms are usually much less apparent than the internal cavities revealed when tubers are cut open. The first evidence of dry rot is the appearance of a slightly sunken, small brown patch on the tuber surface (Fig. IA). Since dry rot pathogens require a wound for infection, the size of the wound will also determine how noticeable the dry rot condition is from the exterior of the tuber. Entry is usually made where the

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tuber was injured at harvest. Dry rot lesions can enlarge even under dry storage, though high humidity and 20°C are optimum conditions for dry rot development (2). Diseased tissues become sunken as they dry out, with concentric wrinkles forming as rot proceeds. At this stage, the internal appearance of the infected tuber changes from a moist, soft, brown-colored lesion to a cavity which is bordered by hard, leathery or chalky textured rotted tissue. Mycelial strands span the cavity (Fig. 1B). Mycelial tufts and fruiting structures (sporodochia) appear on the surface of the rotted tissue in late stages of the disease.

Under extremely humid conditions (near 100% relative humidity), dry rotted tissues may be subsequently invaded by soft rotting Erwinia species. Normally dry brown, irregular cavities containing hyphal strands then become a fluid brown mass of rotted tissue and microorganisms.

In addition to ruining stored potatoes destined for food use, Fusarium dry rot can also degrade seed tubers. Rot proceeds while seed tubers are stored before planting and can continue after seed tubers are planted. Necrotic tissues attract soil insects, especially the seed corn maggot, a known vector of Erwinia species (4). Rhizoctonia solani, the causal agent of black scurf disease of tubers, can also invade dry rotted tissues to contribute to the syndrome. The stand of potato plants resulting from dry rot-infected seed pieces is marked by stunted and missing plants, poor vigor, and low yields.

CONTROL. Species of Fusarium causing dry rot require wounds for penetration, so avoidance of wounds when harvesting and storing tubers is the best means of control. Good ventilation and high humidity at 21°C for three to four days in early stages of storage will promote wound healing and reduce infection (4). The relative humidity should then be reduced to less than 70% in storage bins, thus retarding infection and disease development (4). Storage temperature manipulation is not a very successful means of controlling dry rot, as 10-20°C favors infection and 20-25°C is optimum for fungal growth (4). Rot will progress even at the coldest temperatures safe for potato storage (4). Mature tubers harvested from dead, dry haulms are more resistant to dry rot than immature tubers, and susceptibility to dry rot increases as storage time lengthens (5).

Basic control, however, especially due to the widespread occurrence of these fungi, is by the use of resistant varieties. Potato varieties are available which possess some resistance to dry rot. See the chart below (5).

Varietal reaction to Fusarium solani var. coeruleum		Varietal reaction to Fusarium sambucinum	
Resistant	Susceptible	Resistant	Susceptible
Kennebec	Hunter	Cherokee	Sebago
Sebago	Keswick	Houma	Keswick
Green Mountain	Pontiac	Irish Cobbler	Chippewa
Cherokee	Warba	Hunter	Pontiac
Merrimac	Netted Gem	Warba	
Ontario		Merrimac	
Early Gem		Netted Gem	
Menominee			

Treatment of potato tubers to be used as seed pieces can help control dry rot. Treatments should be applied just after harvest before storage of tubers and/or after cutting tubers prior to planting. Mertect 340-F, Manzate Flowable, Manzate 200, and Manzate 200 Flowable are EPA-registered for treatment of potato seed pieces.

SURVEY AND DETECTION. Look for a small, slightly sunken brown patch on the tuber surface. This symptom is less apparent than the dry internal cavity revealed when the tuber is cut open.

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